CMS CSA07 Report

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December 3, 2007

What is CSA07?

The Computing Software and Analysis Challenge 2007 was an opportunity to exercise as many elements as possible of the CMS Computing and Analysis models simultaneously at a defined scale
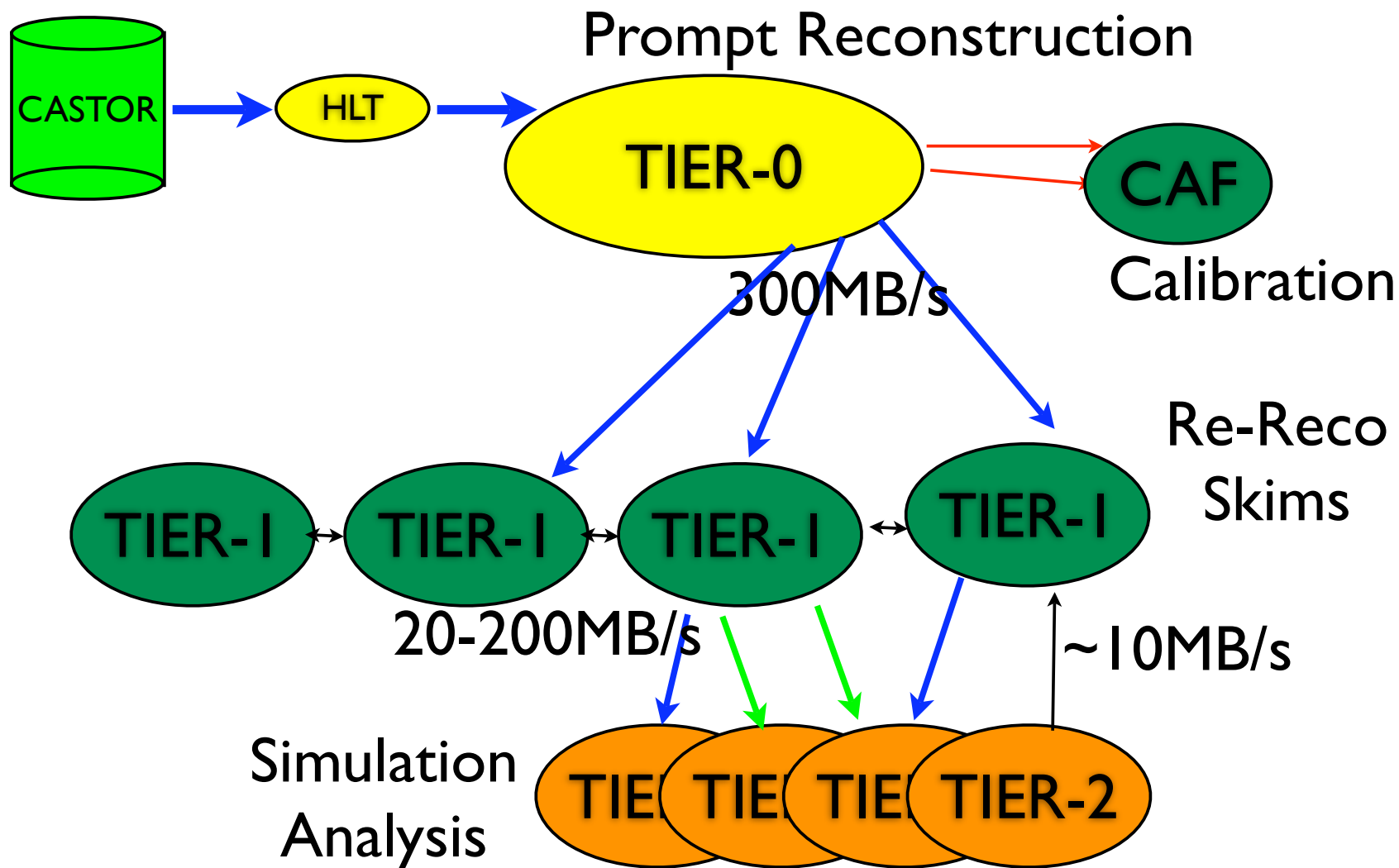
➡ Component testing often does not show interference problems

➡ CSA07 was intended as 50% of the 2008 target

- CMS has had a series of Data Challenges
    - March of 2004, DC04 was intended as a 5% challenge
    - October 2006, CSA06 was a 25% Challenge

Desire to demonstrate computing and offline tools with a diverse and active user community

➡ Previous exercises have relied heavily on load generators

A number of computing model elements had not been tested in previous challenges. We attempted to add these to CSA07

➡ We tried to generate samples similar to the data streams expected

➡ We tried to balance simulation and analysis activities

CSA07 Workflows

Prompt Reconstruction

CASTOR → HLT → TIER-0 → CAF

Calibration

300MB/s

Re-Reco
Skims

TIER-1 ↔ TIER-1 ↔ TIER-1 ↔ TIER-1

20-200MB/s

~10MB/s

Simulation
Analysis

TIE TIE TIE TIER-2

Basic Scaling Items Checked in CSA07

Service	2008 Goal	CSA07 Goal	Status	CSA06 Goal	Status 2006
Tier-0 Reco Rate	150Hz - 300Hz	100Hz	**Achieved Bursts**	50Hz	Achieved
Network Transfers between T0-T1	600MB/s	300MB/s	**Achieved Bursts**	150MB/s	Achieved (6/7 cont.)
Network Transfers between T1-T2	50-500 MB/s	20-200 MB/s	**Some Sites**	10-100 MB/s	Achieved (15 sites)
Network Transfers T1-T1	100MB/s	50MB/s	**Only Opportunistic**	NA	Not Attempted
Job Submission to Tier-1s	50k jobs/d	25k jobs/d	**Achieved**	12k jobs/d	3k jobs/d
Job Submissions to Tier-2s	150k jobs/d	75k jobs/d	**20k jobs**	48k jobs/d	Achieved
MC Simulation	1.5 10^9 events/year	50M per month	**Achieved**	NA	Not Attempted

Tier-0 Workflow

TIER-0

CASTOR   HLT   CASTOR

TIER-1 **TIER-1** **TIER-1** **TIER-1** **TIER-1** **TIER-1**
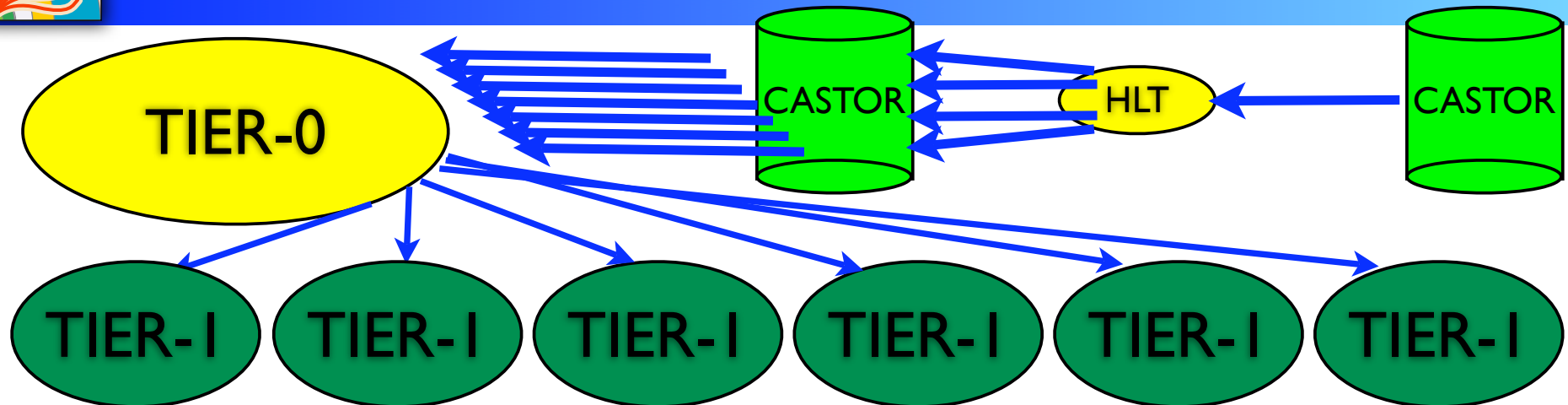
The Tier-0 workflow is similar to what was done for CSA06 with one large addition

➡ We have a pre-processing step to add the High Level Trigger information

➡ In CSA06 we had a minbias stream, a TTbar stream, a Jets stream based on simulation information

● Now data from the Tier-0 looks more like experiment data based on the trigger selection

Data and Application Issues

The events in CMS are 25% to 50% bigger than what is expected in the computing model

- ➡ A number of these problems are known to be solvable, but there was insufficient time before the start of the challenge
  - Digitized and RAW data are both written
  - HLT has more debugging information than expected and more branches

The CMS application had memory issues

- ➡ Several of the preparation steps had to be run in steps each writing intermediate files
- ➡ The number of skim jobs was limited to 1k-2k events per job and a limited number of output modules

At CERN we wrote over 1PB of data (Essentially a good first year)

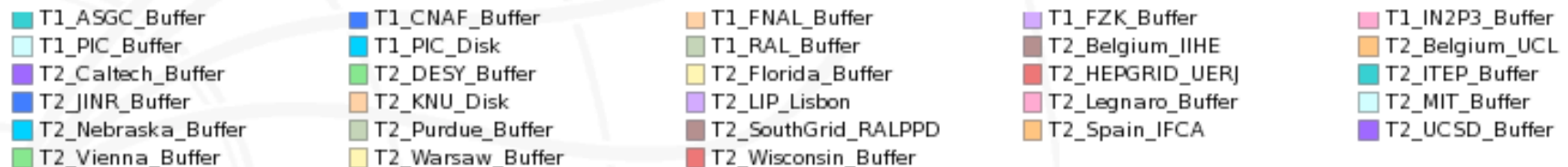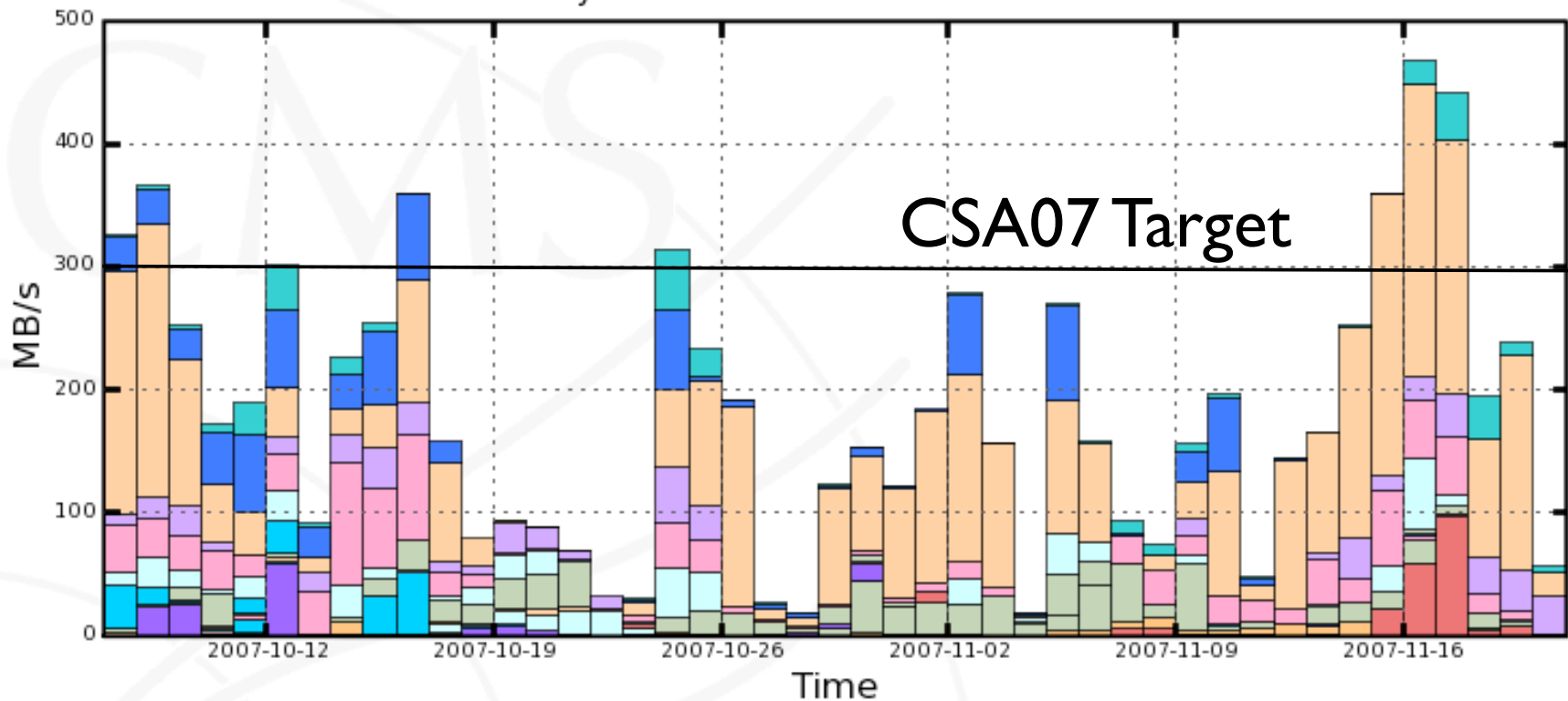- ➡ At FNAL we wrote over 500TB of data into mass storage

Skimming was nearly 1M processing submissions

CMS PhEDEx - Transfer Rate
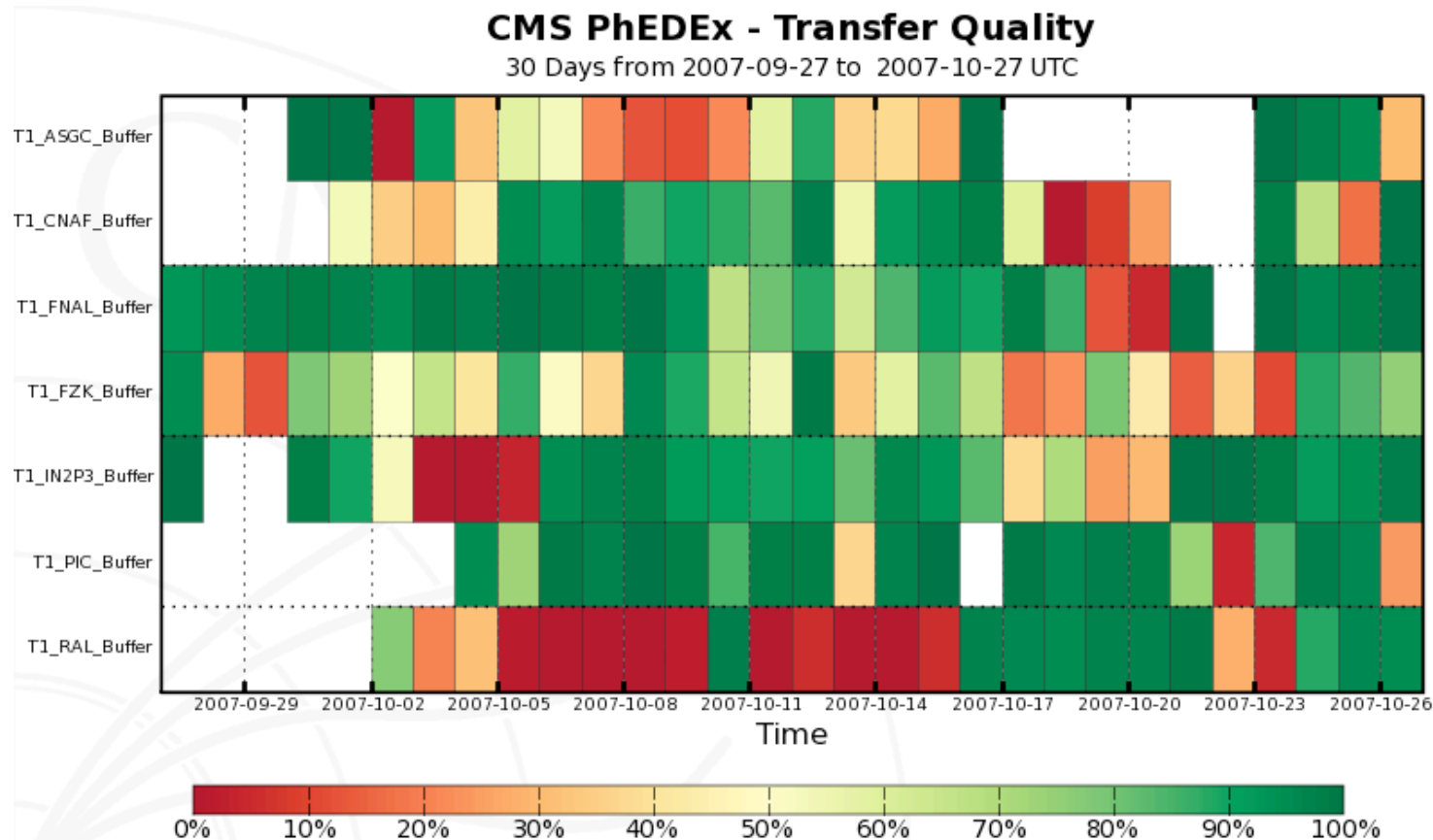45 Days from 2007-10-07 to 2007-11-21 UTC

CSA07 Target

Maximum: 467.24 MB/s, Minimum: 18.59 MB/s, Average: 182.79 MB/s, Current: 56.97 MB/s

Transfer Quality

Transfer quality is not as green as as we might like

➡ Transfer quality is defined as 1 over the number of times we had to attempt a transfer

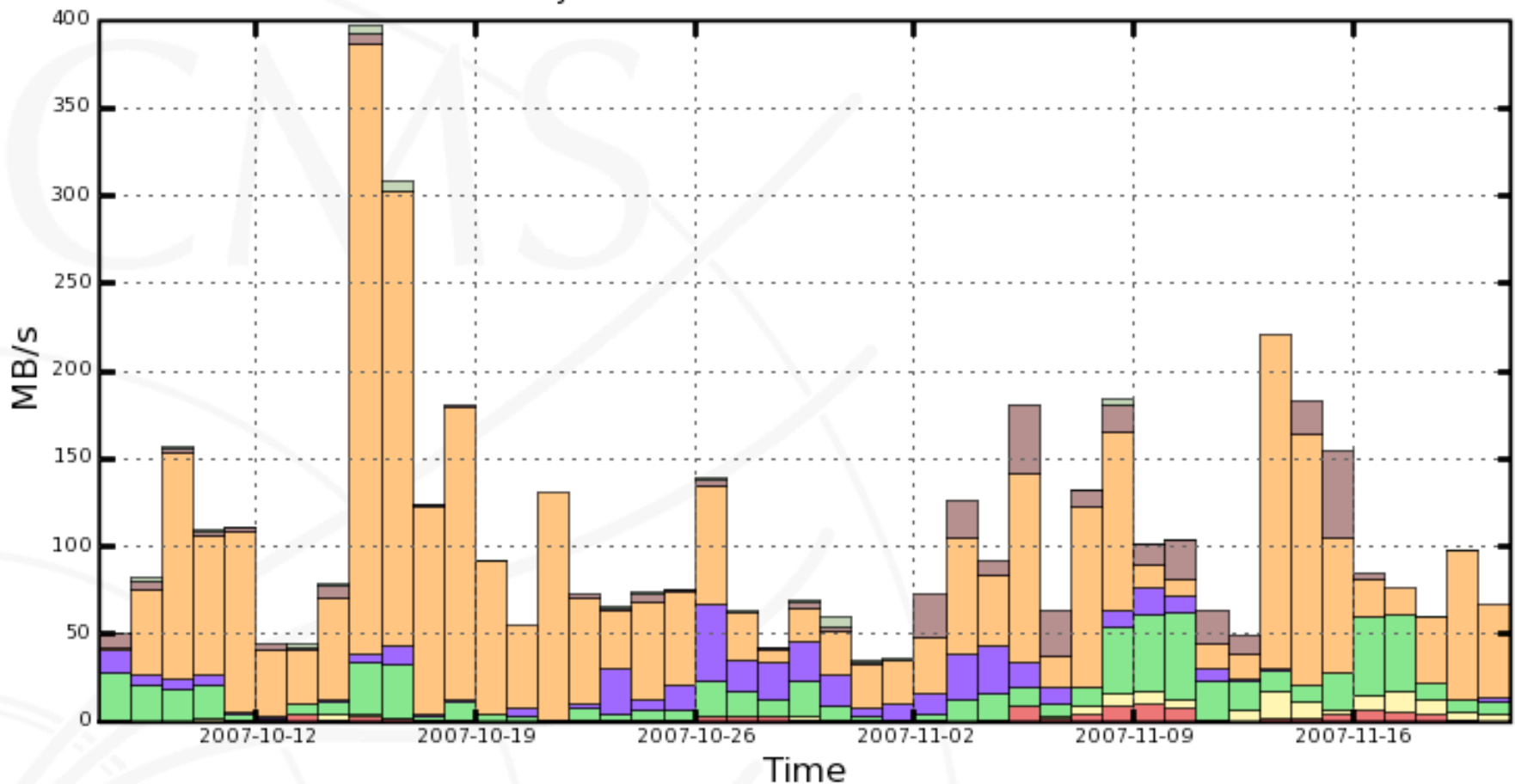➡ There are two end points for each transfer, and in some cases we have stressed both of them

CMS PhEDEx - Transfer Quality
30 Days from 2007-09-27 to 2007-10-27 UTC

CMS PhEDEx - Transfer Rate
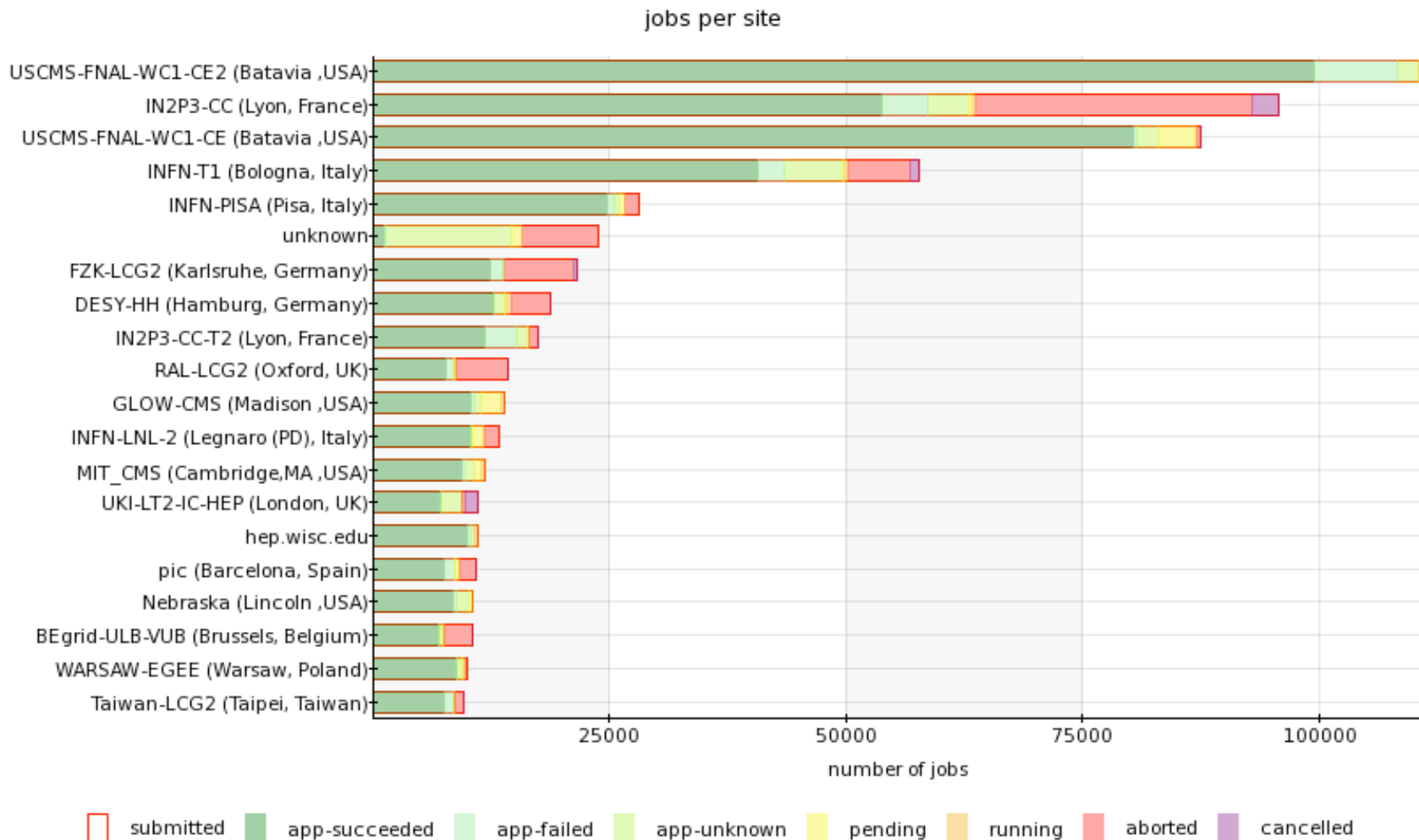45 Days from 2007-10-07 to 2007-11-21 UTC

Maximum: 396.71 MB/s, Minimum: 35.03 MB/s, Average: 106.84 MB/s, Current: 66.71 MB/s

Process Submissions

Between Reconstruction and Skimming CMS Reached the 25k job submissions for production routinely throughout the challenge

➡ Analysis did not reach the target, due in part to availability of data

jobs per site

number of jobs

submitted | app-succeeded | app-failed | app-unknown | pending | running | aborted | cancelled

Outlook

CSA07 was successful in that it stressed the computing, offline, and analysis systems at above 50% of the scale expected next year

➡ We learned a number of issues about the computing systems, the workflows, and the applications

- A lot of items to fix and development areas to finish before data taking

➡ The skims to the physics groups came late in the challenge and are still arriving

- This prevented some of the Tier-1 to Tier-2 transfers we intended to exercise and the analysis of arriving data still needs to be exercised

  - The scale of analysis is not as high as we expected and we need to increase the level of testing before data taking